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OF

OPHTHALMOLOGY

MARCH, 1923

COMMUNICATIONS

A CASE OF SECONDARY CARCINOMATOUS INFILTRATION OF THE PIA-ARACHNOID OF THE BRAIN, PRESENTING EXCLUSIVELY OCULAR SYMPTOMS DURING LIFE: MENINGITIS CARCINOMATOSA

BY

F. M. R. WALSHE

LONDON

I.—INTRODUCTORY

WHILE the occurrence of secondary deposits in the brain in cases of visceral carcinoma is well recognized, yet when this secondary involvement takes the unusual form of a fine microscopic infiltration of the lepto-meninges, the clinical and pathological problems involved become of some interest. The clinical feature which has seemed to justify the recording of the present case was that during life the physical signs were exclusively ocular, whereas commonly this form of carcinomatous involvement of the central nervous system produces a clinical picture akin to that of an acute meningitis. Pathologically, though this is not unique in the condition under consideration, the case is of interest because the lesion was so fine as almost entirely to escape notice on naked eye examination of the brain. Indeed, its nature and extent were not revealed until microscopic investigation was undertaken.

As long ago as 1888, Oppenheim[3] referred to certain cases of visceral carcinoma in which striking symptoms referable to the nervous system appeared in the terminal stages of the disease,

but in which examination of the nervous system, macroscopic and microscopic, revealed no lesion with which these symptoms could be correlated. He concluded that this part of the clinical picture was the result of a toxaemia of the nervous system due to toxic metabolites produced by the cancer cells and circulating in the blood.

Saenger[5] took up the subject in 1901, and, as far as we are aware, was the first to describe the condition now under consideration. His cases bear a closer resemblance to the present than any others we have found in the literature. The first patient was a woman of 46, in whom after removal of the breast for carcinoma a local recurrence had occurred. She came under observation for headache and vomiting, diplopia and bilateral deafness. Examination revealed peripheral palsies of the right sixth and seventh nerves and bilateral nerve deafness. The fundi were normal. The knee jerks were sluggish, but no other signs referable to the nervous system were observed during life. At autopsy the brain presented scarcely any abnormality to the naked eye, but careful scrutiny revealed slight thickening and opacity of the pia-arachnoid along the lines of the vessels on the convexity of the hemispheres and at the points of emergence of the sixth, seventh, eighth and ninth nerves. Microscopically, this thickening proved to be due to an infiltration by carcinomatous cells. Saenger described a second similar case, in which, as in the new case here recorded, the nervous symptoms were unilateral blindness and abducens palsy. He refers to Oppenheim's earlier paper and rejects the hypothesis therein advanced, preferring to believe that Oppenheim was actually dealing with undiscovered carcinomatous infiltration of the lepto-meninges. In 1902, Siefert[7] reported a small series of cases of the kind. He believed that owing to the vascular and embolic mode of spread of carcinoma the deposits in the brain tend to be superficial. When the lepto-meninges are involved, the malignant cells lie in the substance of the pia-arachnoid, spreading later from numerous foci into the subarachnoid space. A small round-celled infiltration may accompany the process, and may be so marked as to suggest the term " meningitis carcinomatosa." Siefert regarded the condition as clinically unrecognizable, but as one to be suspected when the clinical course of carcinoma is accompanied by rapid cachexia, apathy, dementia, delirium, symptoms suggestive of dementia paralytica, or of " hysteria."

In 1911, Schwarz and Bertels[6] recorded a personally observed case of carcinomatosis and reviewed the literature of the subject, which was then and still remains almost exclusively German. The patient was a man in whom symptoms suggestive of gastric carcinoma were complicated by severe headache, accesses of mental excitement and a pulse rate of sixty and less. His condition is

said to have resembled that seen in tuberculous meningitis, when he came under observation in the final stage of his illness. Lumbar puncture yielded a turbid fluid under increased pressure, the turbidity being due to the presence in great abundance of large epithelial cells. The naked-eye appearance of the brain presented no abnormality, but microscopic examination revealed that the subarachnoid space was packed with large cells of epithelial type including some giant multi-nucleated cells. The meninges themselves were normal, but the cells had penetrated into the perivascular spaces of arteries entering the brain and were found, exclusively in this situation, deep in the brain substance. They regarded the tumour from which these cells probably arose as a blastoma, but since a general autopsy was not obtained, the primary lesion was never seen.

From a general consideration of the cases we have quoted, and from that of those reviewed by Schwarz and Bertels, it appears that the usual clinical picture is one of acute meningitis, but the true nature of the condition present may be indicated by the occurrence in the cerebro-spinal fluid of cells of malignant type. Pathologically, the rule appears to be that tumour masses in the brain are absent from cases which show diffuse infiltration of the pia-arachnoid. We must remember, however, that a systematic examination of the meninges is seldom carried out in cases presenting carcinomata in the brain, and, as several authors suggest, "meningitis carcinomatosa" may be more common than is suspected. While such invasion of the nervous tissues as occurs is commonly exclusively perivascular, yet direct extension from the meninges is recorded. In these circumstances, the carcinoma cells destroy and replace normal nervous tissues in the affected regions.

A diffuse sarcomatosis of the pia-arachnoid, strictly comparable both in its clinical course and in the distribution of the lesion has also been recorded by Nonne[2].

II.—CLINICAL

Annie B., a married woman of 57, was admitted to University College Hospital on March 7, 1921, for progressive failure of vision in the left eye, diplopia and headache of six months' duration. For the whole of this period she had suffered from throbbing pains in the head, bitemporal and occipital in situation, and always most severe at night. Within a week or so of the onset of these symptoms she had begun to see double and to notice that the sight of the left eye was beginning to fail. For three months there had been a definite squint of the left eye, and for this period the left eye had been almost blind, so that double vision had ceased to be noticeable. For six weeks preceding

admission she had noticed occasional difficulty in swallowing solids. There had been neither nausea nor vomiting, but she had lost weight noticeably. Her past health had been uniformly good, she was the mother of four healthy children, had lost one in infancy and had miscarried once.

On examination she was seen to be a small, pale, thin woman. She complained of severe bitemporal headache and appeared in pain. Her mental and emotional state was normal. Speech was normal. In the right eye the visual field, acuity and the fundus were normal. In the left eye vision was reduced to perception of hand movements at twelve inches, but there was no manifest defect of the visual field. The temporal half of the disc was markedly pale. Auditory acuity was normal on both sides, and there was no tinnitus or vertigo. The pupils were equal, central and circular. The right reacted normally to light and to accommodation. The left reacted to accommodation and to consensual illumination, but not to direct light. There was a total palsy of the left external rectus, but no other defect of ocular movement. The remaining cranial nerves showed no abnormality. The motor and sensory systems were normal, and all reflexes normal and equal on the two sides. Examination of the skull revealed no local tenderness and the radiogram was normal. The cranial sinuses were normal. The Wassermann reaction in the blood was negative. No visceral lesions nor any signs of malignant disease were observed. There were no enlarged glands.

During the remaining six weeks of life no fresh localizing signs in the nervous system were observed, except for a slight paresis of the left half of the palate and occasional regurgitation of fluids through the nose. She complained of headache of increasing severity and frequency. She was seen by Sir Herbert Parsons ten days before death, and he reported as follows:—"The left disc is pale and its appearance suggests retrobulbar neuritis rather than tabetic atrophy. The visual field is normal for hand movements. The right disc is normal in appearance." During the last week of life the temperature began to rise and she became very restless and excitable, crying out continually and trying to get out of bed, so that morphia had to be given. The accesses of psycho-motor excitement alternated with periods of semi-coma. On auscultation moist sounds were audible all over the chest. Finally, she became cyanosed and died on April 17. Post-mortem examination revealed a healed tuberculous focus at the apex of the left lung and purulent broncho-pneumonia at both bases. There was old mitral stenosis of moderate degree. No signs of malignant disease were found in any part of the body. The base of the skull and the cranial sinuses were normal. The brain appeared normal on naked eye examination, but was some-

what red in colour and on the convexity of the left occipital lobe was a small area of old softening, apparently from an ordinary embolus. The vessels were comparatively healthy. Close examination of the left abducens nerve revealed that it was slightly thickened and opaque in appearance. The optic nerves, chiasma and tracts appeared normal. The pituitary was normal. Unfortunately, the cerebral hemispheres and the cerebellum were not preserved for microscopical investigation. There remained for this purpose the pituitary, the optic nerves, chiasma and tracts,

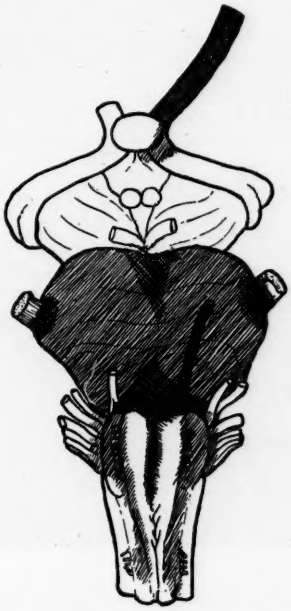

FIG. 1.

the mid-brain, pons, medulla and the first cervical segments of the cord. Almost the whole length of the left optic and abducens nerves was also preserved. On close scrutiny of the preserved portions of the nervous system after some weeks in ten per cent. formalin-saline solution it was seen that the pia-arachnoid covering the ventral surface of the pons and surrounding the cranial nerves at their points of emergence from the brain stem was somewhat thicker and more opaque than normal. This thickening which was barely perceptible to the naked eye was not quite uniform, but was most obvious along the line of the basilar artery and round the emerging fifth and sixth nerves, especially on the left.

On the medulla and on the dorsal surface of the mid-brain no abnormality was detected.

A large number of pieces of tissue from the optic nerves and chiasma, from the cranial nerves and from the brain stem were cut and stained by haemalum and eosin, haemalum and van Gieson, muci-carmine and Weigert's elastic stain.

It was found that the pia-arachnoid in the regions of thickening, and also in places where no thickening was visible to macroscopic examination, was the seat of a malignant infiltration by a cubical-celled carcinoma. The superficial extent of this, as revealed by

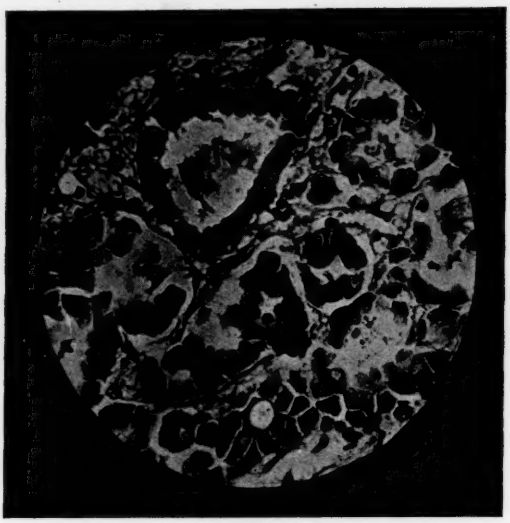

FIG. 2.
Showing acinous grouping of carcinoma cells in meninges.
1/6th in. objective, 4 eyepiece.

the study of a large series of sections, is indicated in Fig. 1. Here the lightly hatched areas indicate the seat of meningeal infiltration, while the deeply shaded areas indicate where, in addition, the nervous tissues themselves were invaded. The part of the brain shown in the diagram is that preserved for microscopic examination. Where the meningeal infiltration was thinnest the infiltrating cells were not invariably arranged on any definite plan, but lay in small scattered groups in the spaces of the pia-arachnoid, surrounded by a sparse small round-cell infiltration. Where the malignant cells were most abundant they were arranged into definite groups surrounding a central space and closely resembling the acini of a secreting gland. (Fig. 2.) The cells

were cubical or columnar in form, possessed an abundant finely granular cytoplasm, and contained mucin in many instances. The nuclei were large and of a coarsely reticular structure. Mr. T. W. P. Lawrence expressed the opinion that the condition was a secondary carcinomatous infiltration, the primary lesion being probably situated in the epithelium of the alimentary canal. Unfortunately no primary growth was found at autopsy. In

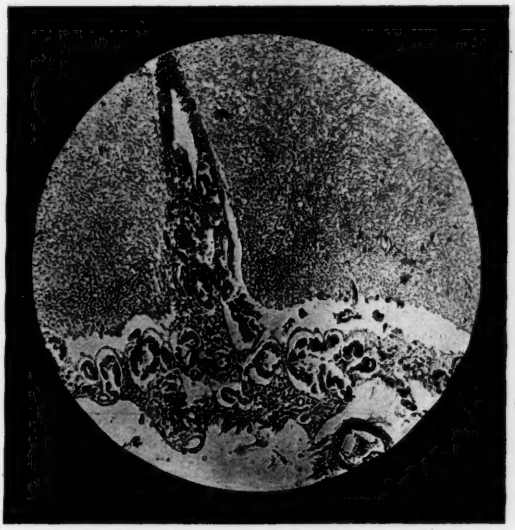

FIG. 3.

Oblique section through small artery entering ventral surface of pons, showing perivascular infiltration by carcinoma cells superficially, and by small lymphocytes more deeply. Groups of cells in acinous formation are seen in the pia-arachnoid covering the surface of the brain. 2/3rds in. objective, 4 eyepiece.

several situations on the ventral surface of the pons, where small arteries were cut in longitudinal section at the point of penetration of the brain substance, a most interesting appearance was to be observed. Immediately surrounding the entering vessel was a sheath of tumour cells in acinous formation, but more deeply in the brain, and in advance of these was a well-marked perivascular infiltration by small lymphocytes (Fig. 3). For the most part invasion of the brain was perivascular, but in the midline of the pons there was also direct invasion by extension from

the meninges (Fig. 4). In addition to the infiltration of the pia-arachnoid covering the ventral and lateral aspects of the pons and medulla and surrounding the cranial nerves at their points of emergence there was a dense infiltration of the sheath of the left sixth nerve and an intense invasion of the nerve trunk itself. In the longitudinal section very few nerve fibres remained and the nerve trunk was a mass of large cubical cells lying in no definite arrangement. The left optic nerve was less intensely

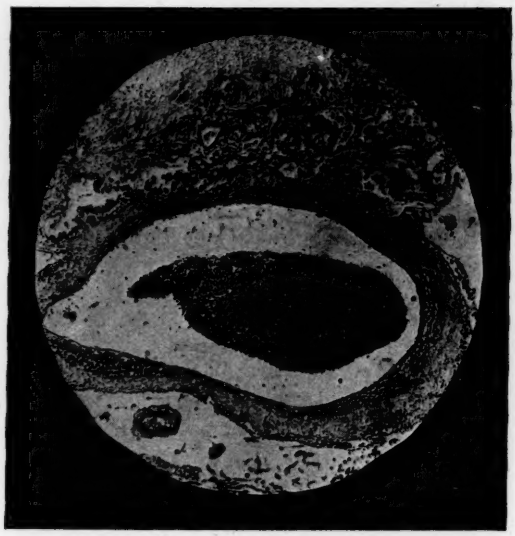

FIG. 4.

Basilar artery, showing lymphocytic infiltration of adventitia. Direct invasion of the brain by carcinoma cells in the meninges is also to be seen.

invaded than the sixth nerve, and was not surrounded in its whole periphery by infiltrated meninges (Fig. 5). Where meningeal infiltration was present, small lymphocytes occurred in abundance round each collection of malignant cells. Invasion of the nerve trunk was by way of the pial septa. Here and there, lying against these were small collections of tumour cells. The proximal part of the nerve was much more involved than the distal portion. In the latter case the meningeal infiltration was sparse and the invasion slight and confined to the peripheral areas of the nerve trunk. The chiasma and the optic tracts were not invaded. There was a single small patch of meningeal involvement on the left border of the chiasma and on its under surface.

The pituitary was normal in structure, but on the left side of the stalk was a small area of meningeal infiltration.

The fifth to the ninth cranial nerves on both sides, but more so on the left, were surrounded at their points of emergence and for two or three millimetres of their courses by a dense meningeal infiltration, the cells lying in closely packed acinous formation. The fifth was, in addition, locally invaded on both sides, though

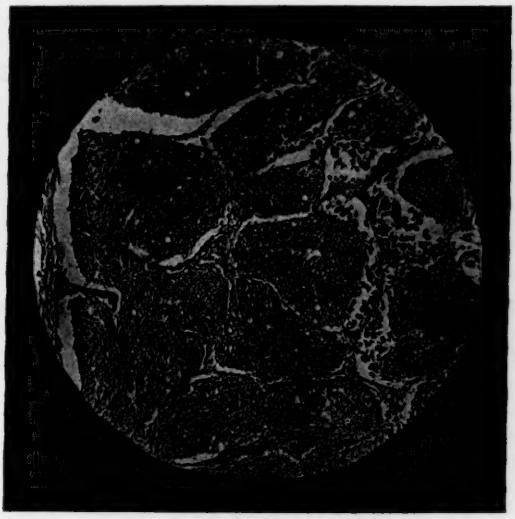

FIG. 5.

Transverse section of optic nerve. Pia-arachnoid at extreme left and not infiltrated at this point. Deep in the nerve and between the nerve bundles are loose groups of carcinoma cells, not definitely arranged in acinous formation. 2/3rds in. objective, 4 eyepiece.

during life, repeated examination had given no clinical indication of this lesion.

The arteries lying on the ventral surface of the pons were surrounded by tumour cells, but their walls were everywhere intact, except that the adventitia of the basilar artery was infiltrated by small lymphocytes (Fig. 4). The walls of the veins, on the other hand, did not escape. In the case of a large vein lying beside the basilar artery, the whole wall down to the endothelium was densely invaded by large cubical cells and by small lymphocytes. No tumour cells were found lying in the lumen of the veins. On the medulla, the meningeal infiltration was

localized as indicated in Fig. 1. On the dorsal aspect of the mid-brain there was no infiltration of the meninges.

Summary: During the last six months of life the patient had suffered from a left abducens palsy and progressive primary optic atrophy with blindness of the left eye. Severe headache with no definite localizing characters accompanied these phenomena. Terminal symptoms were paresis of the left half of the palate and accesses of maniacal excitement. The broncho-pneumonia, which finally closed the clinical course of the malady, cannot be correlated with the intra-cranial condition, but its result was that the pathological study of the brain was made possible at a much earlier stage than would otherwise have been the case. Examination of the brain revealed a fine localized infiltration of the pia-arachnoid by cells of carcinomatous character, cubical and columnar in form and arranged in groups like the acini of a gland. The growth is regarded as a secondary deposit from a primary adeno-carcinoma, which was not found, but which was probably situated in the alimentary tract. The brain tissue on the ventral aspect of the pons was superficially invaded, in some parts by direct extension from the meninges, but also, and more markedly by a peri-vascular infiltration of entering arteries. In this situation, and deeper than the advancing cancer cells was a well-marked lymphocytic infiltration. The left optic and abducens nerves were invaded and surrounded by malignant [illegible].

Several points of interest, clinical [illegible]athological, are raised by this case. The chronic course a[illegible]e occurrence of isolated cranial nerve palsies appear to be [illegible]usual for the condition. The isolated occurrence of ocular [illegible]oms from such a cause must be extremely rare, and is [illegible]closely approached by Saenger's two cases. The diagnc[illegible]e during life was that of new growth at the base of the sk[illegible]d it is doubtful, even if lumbar puncture had been performed [illegible]revealed the presence of tumour cells in the cerebro-spinal flu[illegible]ether a more accurate one would have been possible. There was conspicuous absence of any signs or symptoms indicating involvement of the meninges overlying the cerebral hemispheres, unless the terminal mental excitement be regarded as such. If we may judge by the literature, the clinical picture is commonly dominated from the commencement by cerebral symptoms, delirium, stupor, mental deterioration and Jacksonian fits. Unfortunately, in this case the cerebral meninges were not available for microscopic examination, and it would not be safe to assume that they were free from involvement.

On the pathological side the extreme fineness of the meningeal involvement and the fact that at autopsy it was entirely missed indicates the importance, a point on which all writers on the

subject are agreed, of a routine examination of the meninges in all cases in which visceral carcinoma has been complicated by the development of definite symptoms referable to the nervous system in its clinical course. It suggests, further, the danger of error which lies in the loose invoking of " toxaemia " as an explanation of disorders of nervous function for which no gross cause is readily apparent. The presence of a lymphocytic infiltration in association with the malignant one may indicate simply a meningeal reaction to the presence of foreign cells, or may in part be due to a noxious chemical activity of the latter cells.

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THE IMPORTANCE OF RADIOGRAPHY IN DOUBTFUL CASES OF OPTIC ATROPHY WITH SPECIAL REFERENCE TO PITUITARY DISEASE

BY

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With Radiographic Prints and Notes

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IT is not improbable that many cases of pituitary disease, or disease in the neighbourhood of the pituitary fossa which eventually involves the hypophysis, are missed by ophthalmologists because the only obvious feature in the picture is optic atrophy. This ought not to be so, for it is to them that the majority of cases of hypophyseal involvement apply for relief. The features which tend to put the ophthalmologist off his guard are the frequency

with which he sees optic atrophy, to which he cannot with certainty assign a cause, and the high percentage of pituitary cases which show scanty glandular symptoms. As Fisher has pointed out (*Trans. of Ophthal. Soc. of the United Kingdom*, Vol. XXXI, 1911), primary atrophy is the conspicuous feature of those cases which consult the ophthalmic surgeon. In order to minimize error in this connection, it is always a safe working rule to have a full X-ray examination made of all those cases of optic atrophy in which one is unable to satisfy oneself as to the cause of the condition. Without X-ray evidence it is in certain cases impossible to arrive at a correct diagnosis. In the past two years some eight cases in which trouble in the neighbourhood of the sella was suspected have come to my notice. This is not a very high percentage as the number of patients from which these were derived was about 40,000. Of these eight, three were not clinically sharply defined nor was the X-ray evidence positive. As the trouble in these cases could not be localized to the pituitary region they are omitted. I give below a brief clinical summary of the remaining five, together with a histopathological note on one of them and the radiographic features with prints. It will be seen that in two the clinical evidence is fairly typical, whilst in the other three, optic atrophy so overshadows all the other symptoms that without radiographs the cases might easily have remained undiagnosed.

The value of finding a high sugar tolerance in two cases is doubtful, as certain patients without pituitary trouble showed this sign equally well marked. This is interesting and may be related to the nature of the diet.

CASE I

Tumour in the pituitary region giving rise to marked neighbourhood symptoms, and total blindness with hypopituitarism.

D. D., Eurasian female, aged 8, presented herself at the out-patient department of the Government Ophthalmic Hospital on May 2, 1917. She had fallen down when in school in the previous month, and three days afterwards discovered that she could not see with the right eye. She gave a history of headache during the two previous years, When the headache was severe she had giddiness and vomiting. There had been squint during this period, but it passed off. She had also severe attacks of nose bleeding.

Condition on admission.—R.E.V.=0; L.E.V.=6/18. R.E. disc uniformly pale, complete atrophy, free from cupping or signs of previous inflammation. L.E. fundus normal. Fields not taken. Nose, throat and naso-pharynx healthy. Last right upper molar decayed. Reflexes normal. Wassermann.—negative; von Pirquet.—negative. Blood.—Hb. 85 per cent., polys. 65 per cent., eosinos.

13 per cent., lymphos. 15 per cent., large monos. 7 per cent. Urine.—Albumen nil, indican plus, sugar nil. No further details available.

1/9/17.—The patient took her discharge and was not seen again until her re-admission.

8/10/19.—Re-admitted. R.E.V.=O.; L.E.V.=P.L. Is very drowsy and will not take food. Pupils moderately dilated and inactive; has had headache and vomiting from time to time since she left hospital. Fundus examination:—both discs very white, vessels normal, edges sharp, primary optic atrophy.

2/5/21.—Re-admitted. I saw the case on this date for the first time. The note on the condition is as follows:—the child is underfed, thin, and undeveloped and weighs 40 pounds. The mucous membranes are pallid. There is pyorrhoea alveolaris. The skin is thin, smooth, and waxy. Secondary sexual characters are undeveloped. She has not menstruated, has no body hair, hair of the head is fine and thin. She has left torticollis. The left sternomastoid and trapezius are in spasm. There is left facial paresis. She keeps the mouth open and looks like a marked adenoid case. Speaks with a nasal intonation (on enquiry it is found that this feature was not present formerly). Adenoid growths can be seen and felt. She has tenderness over the occiput and cervical spine.

The vertebral column is straight. She is bright when spoken to, but for the most part inclined to doze. She has occasional headaches and vomiting attacks which come on suddenly and are associated with giddiness. The hands and feet are small, the fingers slender and tapering. The subcutaneous fat is scanty. Urine.—The urine is normal in reaction, but there is slight polyuria (carbohydrate tolerance not recorded). The deep reflexes are accentuated. Babinski's plantar reflex is normal on the right, abnormal on the left. The evening temperature varies irregularly. The pupils are dilated and inactive. The discs are uniformly white, laminae visible, arteries smaller than normal, edges of left disc not so sharp as right. Family history.—The father and mother are alive and well, also one brother and two sisters. There is no suggestion of syphilis in the family.

11/6/21.—Sent for X-ray examination. Tumour in sellar region, spinal column normal, few small opacities in lungs (See print No. 1 and note at end of article).

9/7/21.—Naso-pharynx explored. A small portion of the projecting mass of vegetations removed for examination; these were found to contain lymphoid tissue with fine calcareous particles.

14/7/21.—Died of septic meningitis.

Post-mortem.—First and second fingers introduced behind soft palate, mass of soft tissue in naso-pharynx explored. With a comparatively gentle push the fingers were made to enter the middle fossa passing through a soft gritty tissue which felt like granulation

tissue permeated with fine calcareous particles. Portions of bone and growth hooked out; no further examination permitted.

Histopathology.—On examination of the growth, I was at first considerably puzzled as to its nature, for in parts it consisted entirely of large degenerate squamous cells, which took up the picric of the van Gieson stain. Careful study of a number of sections showed that the bulk of the tissue was composed of epithelial elements of a squamous type undergoing a hyaline degeneration. In some places there was a whorl arrangement resembling the formation of a perles in an epithelioma. A few of these squames retained their cell structure, most of them had merely an outline. In other parts there were columns of a more regular high cubical epithelium. Throughout the sections there was evidence of calcareous deposits of an amorphous nature.

The tumour apparently was one of those extra-pituitary neoplasms belonging to the group of hypophyseal growths characterised by the proliferation of epithelial elements of a squamous or pavement type, said to develop from a congenital *anlage* associated with the formation of the pituitary body from the anterior end of the stomatodaeum.

As far as I can find in the literature at my disposal such tumours are very uncommon. The epithelial elements tend to assume adamantine characters and undergo keratohyaline degeneration developing concentric formations. As metastases are not formed one cannot call them epitheliomata. They might perhaps be termed epithelio-blastomata, progressive but not metastatic.

The growth was probably of the variety described by Ernheim referred to by Cushing, but I am unable to obtain the original articles on the subject.

CASE II

Tumour of the pituitary region, optic atrophy the chief feature, inconspicuous glandular symptoms suggestive of former hyperpituitarism followed by dyspituitarism.

On 7/9/21.—M., a Hindu, male, aged 21, came to the Government Ophthalmic Hospital almost blind. He noticed his sight getting dim five years ago, much worse for the past two years. Has been led by the hand for six months. Had headache and vomiting 2 years ago. A year ago had three or four fits (uncinate seizures?). At present has no headache, but gets attacks of giddiness and staggering.

Conditions.—R.E.V.=H.M., L.E.V.=Fingers at 9 inches. The pupils are dilated, but re-act to light and accommodation. Nothing else remarkable about eyes except the disc changes. Fundus.—No evidence of inflammatory trouble. Discs right and left show typical

primary optic atrophy. The laminae are very distinct. Tension, normal in both eyes. The naso-pharynx is normal, also the nose; power of smell good. The cranial nerves normal. The deep reflexes are exaggerated, the plantar reflex is extensor in type. No general pressure symptoms except the giddiness and headache.

The patient looks big and massive, much more so than the average patient admitted, but it cannot be said that there is gigantism. There is no characteristic change in the skeleton. He is bull necked but the shoulders and sternoclavicular region show nothing abnormal. He has a coarse face, thick lips, a wide flat nose and a tendency to maxillary prognathism without spacing of the teeth. (It may be noted that many of the patients here show prognathism with spacing so that this feature is not of very great help, nor is the absence of crescents of the nails, since this feature is very common amongst ordinary patients.) The hands are very large and coarse, but there is no definite metacarpal thickening. The feet are small and well shaped, almost too small for the body. The hair of the head is fine, but, on the body, not excessive and normal in distribution. The skin of the body is coarse and thick; secretion about normal. Adiposity is not marked, but he is well covered and says he is getting fatter. He is of average intelligence, inclined to be drowsy. He does not admit sexual precocity, nor has he loss of libido now. Genitals normal. Urine.—Sp. Gr. 1016, acid, no albumen, no sugar. Total amount passed in the 24 hours less than normal, about 38 ozs. Sugar tolerance high (300 grammes glucose). Blood.—Hb. 80 per cent., polys. 60 per cent., eosinos. 18 per cent., lymphos. 20 per cent., large monos. 20 per cent., B.P. 130 mm. Hg. Pulse.—Varies from 70 to 100 a minute. Temperature uniformly subnormal, hands always feel cold.

Syphilis.—No history, but some clinical evidence. Wassermann —negative. Tuberculosis.—No clinical evidence, von Pirquet negative. X-ray Examination.—A large growth present in the sella region (see print No. 2 and notes).

CASE III

Definite enlargement of the sella, few glandular symptoms, characteristic fields.

P., male, Hindu, aged 35, first came to the Government Ophthalmic Hospital, on May 28, 1919, complaining of defect of sight for 3 years, worse for the past 3 months. He has had headache on and off for 3 years, constant for a week, had suffered from giddiness for 3 months, no vomiting; was married twice, has three daughters by the first and one son by the second wife, the latter had one abortion. Has no nose complaint. An X-ray photograph was taken at this time which was lost. It gave no definite information.

Vision.—R.E.=6/9; L.E. = 6/5. Tension normal both eyes, right pupil sluggish, left pupil active. Eyes otherwise normal except for the appearance of the fundi. On admission there was oedema of the optic nerves and surrounding retinae with great fullness of the veins and tortuosity of the finer twigs—a mild degree of choked disc. The R. field on June 2, 1919, is shown in the chart No. 1. The naso-pharynx was apparently normal; cranial nerves and deep reflexes normal. The only recorded general pressure symptoms were head-ache, giddiness, and choked disc as noted above. There was no

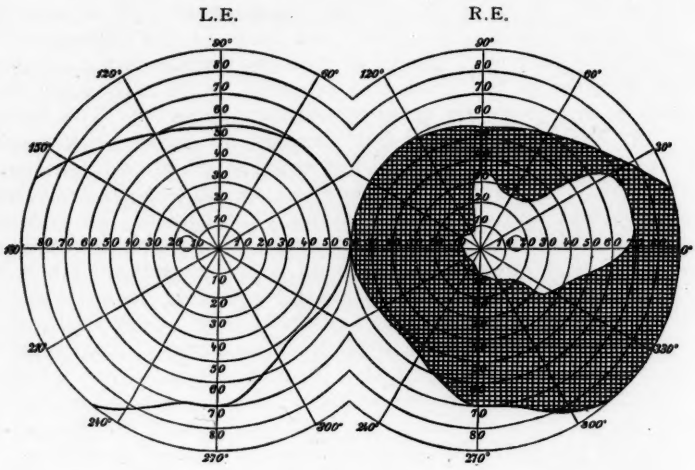


CHART 1.—With 4 mm. white.

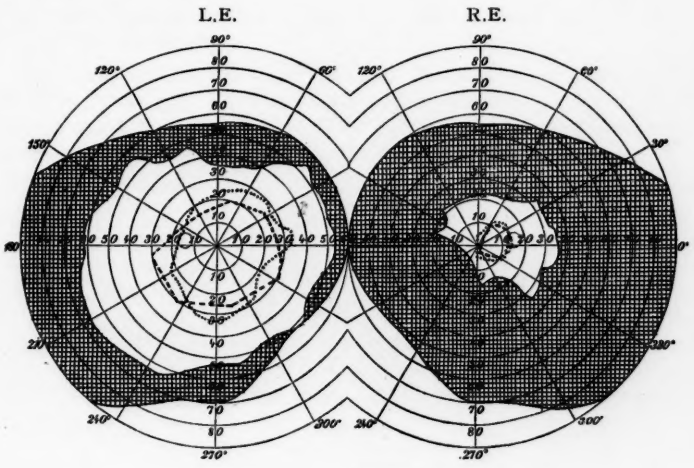
history of fits, glandular symptoms were inconspicuous, the skeleton showed nothing unusual.

The patient was a moderately tall, well-built man with healthy skin and ordinary distribution of hair, well covered, but not adipose. Distribution of fat normal. He had been very thin as a student and remained so to the age of 20. His sexual functions were normal as also his voice and general intelligence.

Urine.—Sp. Gr. 1012, no albumin, no sugar; sugar tolerance not recorded. Normal in quantity. Blood.—Hb. 93 per cent., polys. 64 per cent., eosinos. 12 per cent., lymphos. 20 per cent., large monos. 40 per cent. The cells were normal. Blood pressure between 108-120 mm. during the last half of 1919. Pulse rate 80-90. Temperature remained about normal.

Syphilis.—No history or clinical evidence, Wassermann reaction negative. Tuberculosis.—No clinical evidence, von Pirquet negative.

Progress.—There was very little change in the patient's general condition from the time he was first observed. The charts of fields from time to time are shown and the following notes give the changes in the fundus picture (see charts 2, 3, 4, 5).



Red - - - - - - Green ....

CHART 2.—4 mm. white and coloured objects at 33 cm.

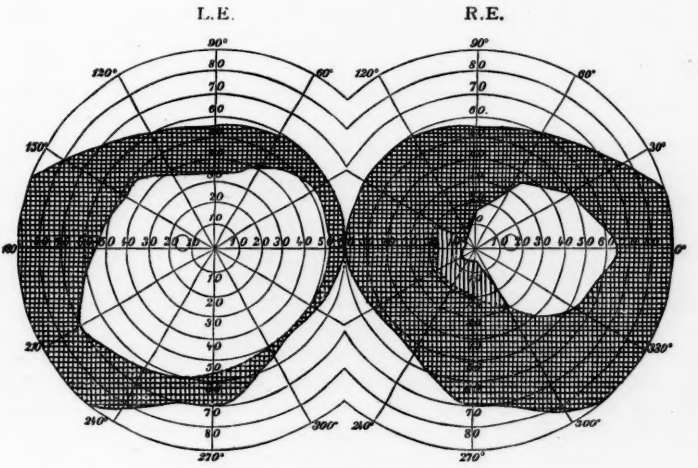


CHART 3.—With 4 mm. white.

31/5/20.—The right disc is uniformly pale, its edges are fuzzy. There is no swelling, the veins are full. The left disc uniformly salmon pink, vessels fuller than those on the right. The superior nasal quadrant shows a considerable diminution of pigment.

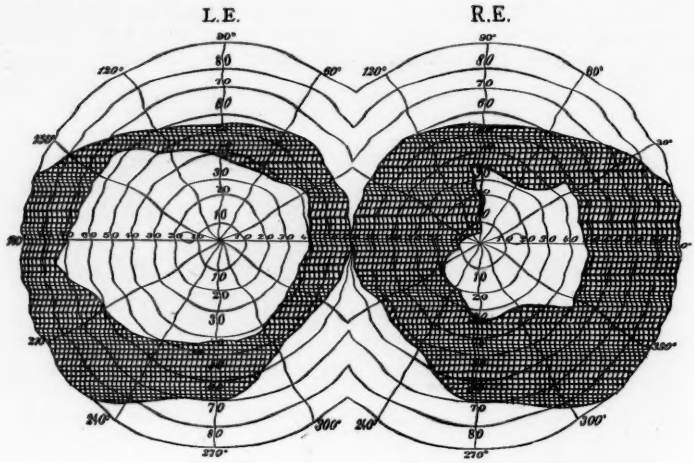


CHART 4.—Field taken with 4 mm. white square.

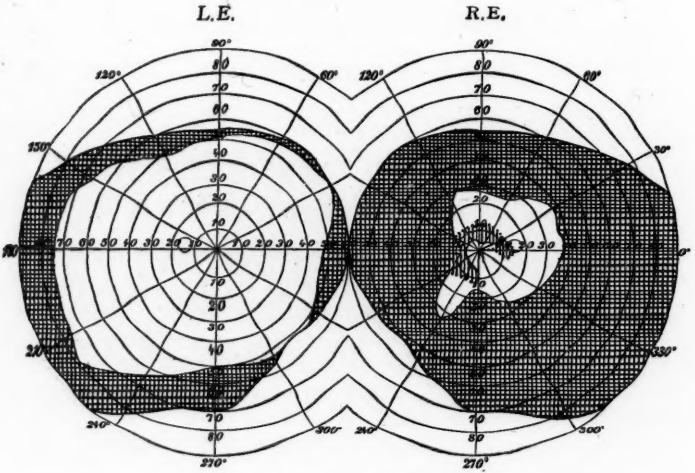


CHART 5.—With 4 mm. white.

2/5/21.—The right disc is now uniformly pale. It is very slightly swollen and there is a hazy edge blending with a slightly oedematous retina. The veins are engorged and the finer twigs are tortuous. The left disc is different in colour. It is pinkish and perhaps a little more swollen than the right, but the amount of swelling in either case is small. The retina is similar on both sides. Optic atrophy is commencing.

Treatment.—30/5/19. The patient was put on extract (whole gland) twice daily. This was stopped on October 6, 1919. It was *recommenced in April, 1920, and continued, together with potassium* iodide, till the end of 1920. Treatment then ceased.

Further Progress.—5/4/21. An X-ray photograph was taken by Captain Barnard who found a definite enlargement of the sella with increased markings of the vessels on the inner table. (A print of this radiograph is not shown; it is in no way different from the print which is given. See Fig. 3 at end.) Treatment was now started at the General Hospital, and the patient was put on hormotone and X-ray exposures were given as follows:—

2/5/21.	2 sab B.	through	3 mm. aluminium	R.	temporal region
4/5/21.	„	„	„	L.	„
9/5/21.	„	„	„	R.	„
12/5/21.	„	„	„	L.	„
16/5/21.	„	„	„	R.	„
19/5/21.	„	„	„	L.	„
21/5/21.	„	„	„	R.	„

Patient had to leave Madras. X-ray treatment discontinued.

At this time it was noted that there was an aneurysmal dilation of the carotid in the upper part of the neck on the right side. The patient continued hormotone for some months and was then lost sight of till January 16, 1922 when the following note was made:—General condition much the same, patient quite cheerful and able to carry on his business as a pleader, says he is very little fatter if at all, inclined to be lazy and to put off work, feels drowsy. Sexually there is no definite decrease in libido and power; he is not impotent. He confirms the statement above that as a student he was very thin and only started putting on flesh at the age of 20. He is now 38 and is able to carry on his work quite well. A second radiograph at this time shows no change (see print No. 3 at end of article.) The patient was put on fresh sheep's gland, approximately one gland daily and allowed to go home.

CASE IV

Enlargement of the sella with definite primary hypopituitarism and characteristic nerve involvement. Dystrophia adiposo-genitalis.

R.D., European, aged 36, consulted me on July 22, 1920. He had been quite well till 1918. Early in 1919 he began to get headaches. The sight first became affected in April, 1919. He consulted an eye specialist in the July of that year. He could at that time read and write quite well. He could still read newspapers in January, 1920, but the eyes got tired and painful after a short time. He noticed that he had become much fatter in the past two years. He had syphilis in 1911 and had full courses of "606" and Hg. On a second occasion (starting March, 1920) he had novarsenobillon once a week, five doses.

27/7/20.—R.E.V.=6/60; L.E.V.=6/60. Occasional flashes of better vision. Can only read about ten minutes, then gets very tired and the sight gets blurred so that he has to discard the paper or book. Vision of the bitemporal hemianopic type. Fundus, early primary optic atrophy.

Tension normal both eyes. Pupils medium, round, symmetrical, accommodation reflex normal, light reflex present with hippus. Headache much less frequent than formerly and none at present, no giddiness. Romberg's sign negative. Has had no vomiting, nose bleeding, or fits. He feels very sluggish and has been putting on flesh very rapidly. He is a short thick-set man, well formed but for the adiposity, which is generalized. Urine.—Shows neither sugar nor albumin. Anaphrodisia marked. Fields.—Bitemporal hemianopsia very sharply marked. (See chart No. 6.)

24/7/20.—X-ray examination showed enlargement of the sella, of a shallow scooped out type. The radiographic evidence was "in favour of pituitary tumour." (The print is not available.) He was sent to England almost at once to see Col. Kirkpatrick, who has kindly furnished me with the following details:—

30/8/20.—First seen just after his arrival from Colombo. His sight had failed considerably on the voyage; his headaches had improved slightly. R.V.=Fingers near face on the nasal side; this was limited to a very small part of the nasal field.

L.V.=Fingers at 5 metres. The right field could not be taken and the left showed temporal hemianopsia. The retinal veins were full and the smaller branches were corkscrewed. The right pupil reacted very sluggishly to light. Opinion that the trouble was due to pituitary pressure was confirmed by Dr. Gordon Holmes. Cerebro-spinal fluid examined gave a negative result, this and the

blood being reported on as normal. Symptoms increased and an operation for the relief of pressure was recommended to be performed without delay. Mr. Percy Sargent operated upon him on September 15, 1920, and reported that he found a considerable degree of general intracranial pressure, which was apparently due in part, at any rate, to the very large amount of cerebro-spinal fluid beneath the arachnoid. There was also an abnormal quantity of fluid at the base on elevating the temporal and frontal lobes; the right optic nerve and edge of the chiasma were seen, but no tumour was visible.

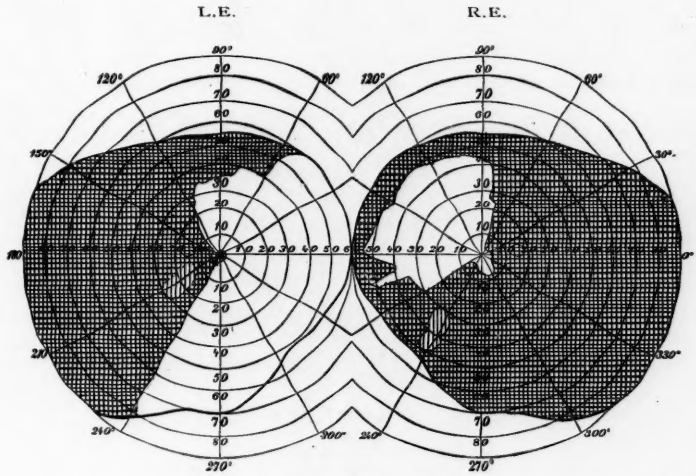


CHART 6.—10 mm. white object at 33 cm.

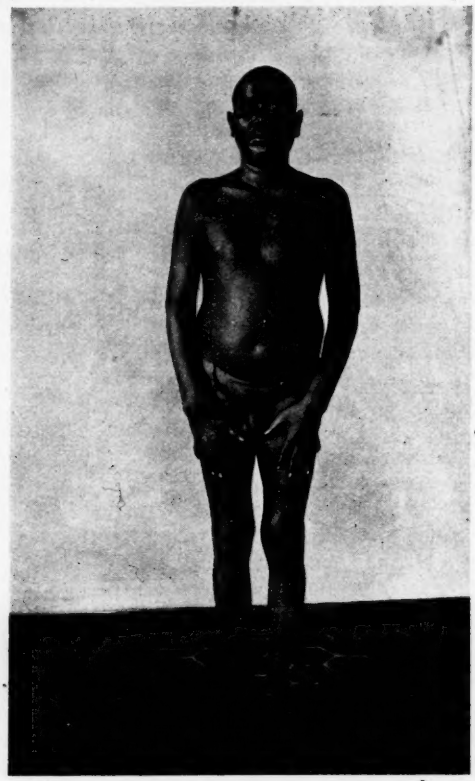
His headache disappeared and his sight improved slightly after the operation. The retinal veins lost the turgid appearance which they formerly showed. The improvement was maintained up to the end of January, 1921. He then suffered from an attack of influenza with bronchitis, gastritis, and rheumatism and the sight began to fail again. Signs of pituitary deficiency made their first appearance, the diagnosis being again confirmed by Dr. Gordon Holmes, who recommended that he should take pituitary extract and return to the East. This he did in May, 1921.

When last seen at the end of April, 1921, his left vision was 3/60 in the nasal field. The nasal field was slightly contracted above and below. There was a small area in the right nasal field with a vision of 1/60.

CASE V

Optic atrophy with changes in the pituitary region revealed by radiograph, inconspicuous glandular symptoms suggestive of hyperpituitarism followed by dyspituitarism.

On the 18/2/22, T., Hindu, male, aged 30 years, was brought to the hospital blind. He states that his sight started to get dim



four years ago and that for the last two years he has been blind, gives a vague history of headache on and off for some time with vomiting and giddiness. He is a widower, had four children, three of whom died. At present feels quite well except for blindness.

Condition.—R.E.V. = O; L.E.V. = O. Pupils dilated and inactive, nothing else noted about the eyes except the disc changes.

Fundus.—Bluish disc with the laminae showing, arteries somewhat narrowed. Primary optic atrophy both eyes. Tension normal

both eyes. Naso-pharynx normal, teeth sound, smell normal, deep reflexes normal, no symptoms of intracranial pressure. The patient looks massive and heavy with a marked stoop and head thrown forward. He is pot-bellied and the hands and feet are short and thick. The head is wide and massive. There are, however, no classical features of acromegaly or gigantism. Radiograph of the hands does not show the changes in the phalanges which one might expect in hyperpituitarism. There is marked adiposity of the trunk (see photograph). The testicles are small, sexual appetite was formerly normal, but has been diminished for eight years and lost altogether for two years. He has average intelligence and normal behaviour.

Urine.—Sp. Gr. 1012, acid, no albumin, no sugar. Quantity 33 to 40 oz. in 24 hours, sugar tolerance high (300 grammes glucose).

X-Ray Examination.—Sella Turcica is elongated extending under the anterior clinoid processes. Posterior clinoid processes absent. There is poor definition in the pituitary region and the fossa seems to be enlarged downwards and forwards (see print No. 4). The patient was kept under observation for four months and during this time was treated with mercury and potassium iodide. There was no change in condition at the end of this time nor was anything observed of importance. He never complained or showed that he suffered any discomfort.

Blood.—Polys. 70 per cent., eosinos. 10 per cent., lymphos. 16 per cent., monos. 4 per cent. Blood pressure 130 mm. Hg. Syphilis.—No clinical evidence. Wassermann—negative. Tuberculosis.—No evidence.

Radiographic Notes

No. I

The whole outline of the sella Turcica is obliterated. There is total destruction of the posterior clinoids. The anterior clinoids are partially destroyed and the sphenoidal sinus shows evidence of invasion.

The vertebral column appears normal and the lungs are fairly clear. Tumour of the pituitary region. (See print 1).

No. II

An apparently enlarged sella Turcica. There is partial destruction of the clinoids and invasion of the sphenoidal sinus. The whole vault shows evidence of pressure. A faint outline of the pituitary fossa is seen which rather suggests only partial destruction. Nothing definitely abnormal in the metacarpal bones.

Growth probably external to sella. (See print 2).

NO. III

A large, deep, sella Turcica. The clinoids are present but the posterior processes appear "thin." The vessel grooves are abnormally marked.

Pituitary enlargement, with expansion of sella. (See print 3).

NO. IV

The sella Turcica is elongated, extending well under the anterior clinoids. The posterior clinoid processes are destroyed. There is some extension downwards, probably involving the sphenoidal sinus.

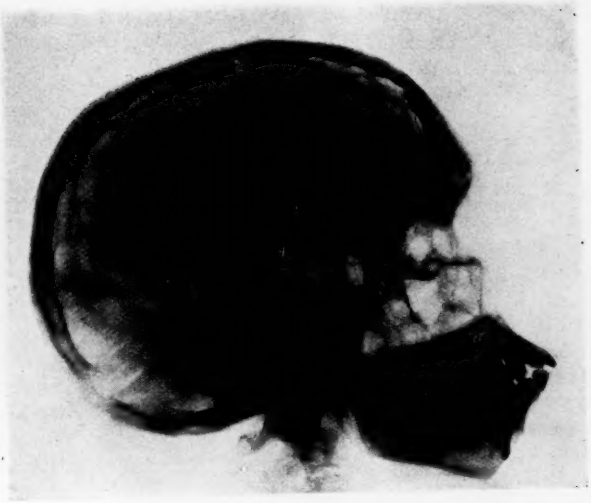
Extra-pituitary growth.

Thickening of the metacarpals is doubtful. (See print 4).

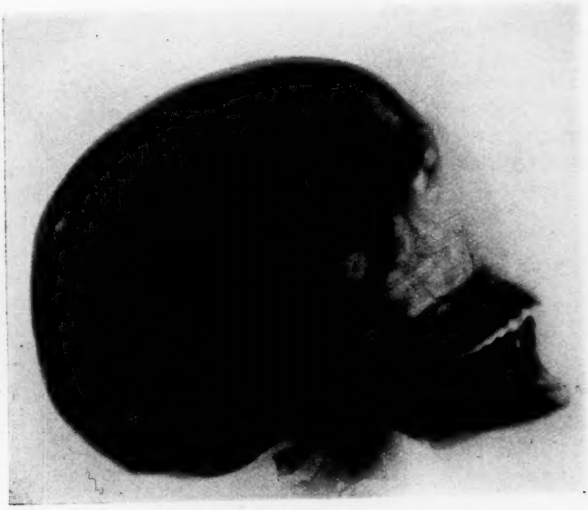
PRINT 5

Dry normal skull.

No. 1.—D.D.

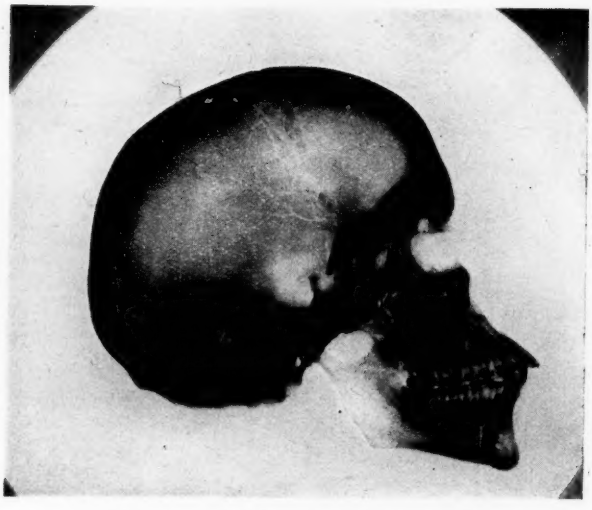


No. 2.—M.



No. 3.—P.

No. 4.—T.



PRINT 5.—Dry skull for comparison—normal.

THE LADD FRANKLIN HYPOTHESIS OF COLOUR VISION

BY

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As the incompatibilities of the Hering and Young hypotheses of colour vision became more obvious, there occurred to more than one experimenter the idea of devising some intermediate theory which would avoid the pitfalls which the older hypotheses appeared to have encountered. In this way the theories of McDougall, Schenck, and others came into being. Mrs. Ladd Franklin's hypothesis may be quoted as another example. She regards the fundamental and essential feature of the Young hypothesis to be the fact that all known shades of colour can be matched by mixtures of the three pure spectral colours—red, green and blue. As the fundamental fact of the Hering theory she regards the existence of " opposite " pairs of colours, red and green, yellow and blue, black and white. On this foundation she erects the following structure :—

There was initially in the earliest stage of development of the organ of vision but one sensation—that aroused by white light and its negation. This underwent gradual elaboration, first into two sensations, one of short wave length, blue light, and the other into long wave length, yellow light. Later, a further elaboration of the yellow sensation occurred by its partial differentiation into sensations for green and red. So that we have present in the foveal cones of normal-sighted individuals, according to Mrs. Ladd Franklin, five sensations, those for white, blue, yellow, red and green. In the periphery of the normal-sighted retina, and in the fovea of certain colour-blind persons, the process of development has not been completed—that is, that in her opinion colour blindness is atavistic.

Having thus briefly stated the theory, I propose to discuss three things :—

1. Its ability to fit in with all the known facts of colour vision.
2. Its novelty; and
3. Its utility.

The first point which comes up for consideration is the compatibility of the hypothesis with the duplicity theory of von Kries, because, rightly or wrongly, I regard this to be the touchstone on which all existing colour theories should first be tried, before other tests are applied to them. This ordeal Mrs. Ladd Franklin's

theory passes successfully, because she states that the recognition of a rod mechanism for night vision and a cone colour sensitive mechanism for day vision "was, of course, a fundamental and essential part of it from the beginning."

The facts of colour vision are explained by the theory as follows:—

Suppose, in the first place, that white light falls on the retina, the white-black substance is decomposed and its breakdown products stimulate the cones, arousing a sensation of white light. If the light be blue, breakdown products corresponding to blue light are alone present and a sensation of blue results. If yellow light be concerned instead, a similar process causes a yellow sensation. If both blue and yellow light fall on the same part of the retina, the breakdown products corresponding to both are present, and they combine to reform the mother-substance from which they were first differentiated, and this stimulates the cones with a sensation of white light. If more of one substance is present, e.g., the blue one, a bluish white light will result and vice versâ. In a similar manner red and green, when present alone, stimulate the corresponding sensations, but when present together the breakdown products which they produce recombine to form the yellow substance, and thus a sensation of yellow light results. If red, green and blue lights be all three present simultaneously, first the breakdown products produced by the red and green light re-combine to form the yellow product, and then this combines with the product formed by the blue light to form the original substance which stimulates the white sensation.

Colour-blindness is accounted for by a partial or complete deficiency of one of the photo-chemical substances, or by an abnormality in the absorption curve of one or more of them, as is the case with Young's theory.

Mrs. Ladd Franklin has elaborated her theory so that it will make a show of accounting for the main facts of simultaneous and successive contrast. We need not, however, go further into these matters because it is now established, almost beyond dispute, that while colour vision depends on peripheral analysis, i.e. in the retina, simultaneous and successive contrast are due to processes of central origin, i.e. in the brain. It is not therefore necessary for any hypothesis which is supposed to represent the peripheral processes to offer an explanation of contrast as well.

Lastly, we come to peripheral vision. Now, since according to Mrs. Ladd Franklin's theory, the red and green sensations are both developed from the more primitive yellow, we should expect the sensation of red and green to be found beginning together at one and the same retinal boundary, as one passes the test stimuli

from the extreme colour defective periphery towards the centre of the retina with its full colour perception. The most recent work on peripheral vision, that of Ferree and Rand, in America, shows that with test lights of equal intensity, but different colour, the blue, yellow and red sensations occur together over a considerable area, but that the green sensation is found to occur over a considerably smaller one. Now it is well known that the eye suffers from both chromatic difference of focus and chromatic difference of magnification. Assuming that the latter has a magnitude in the case of the eye equal to that of a mass of water of the same approximate optical properties, Gullstrand calculated that blue rays would form images whose distance from the optical centre of the retina (where the optic axis cuts the retina) would be 3 per cent. greater than the distances from the centre for the images produced by red rays. That is, that in order that a blue ray and a red one should enter the eye and fall on the same point of the retina, the angle that the blue ray made with the optical axis would have to be roughly 3 per cent. greater than that made by the red ray. It is not stated in Ferree and Rand's paper whether they have taken this factor into account when they say that blue, yellow and red stimuli commence to be correctly recognized at the *same* angle with the optical axis. This, however, is a matter of detail; what is clear is that red stimuli are recognized at much greater angles than are green, whereas, according to Mrs. Ladd Franklin, they should occur together (with a possible 1 or 2 per cent. greater angle in the case of green owing to the chromatic aberration of the eye).

This would appear to be a fundamental objection to the theory. It may be that Mrs. Ladd Franklin can modify, or has already modified, her theory so that it avoids this difficulty. In that case the writer must offer his apologies.

The questions which remain to be considered concern the novelty and the utility of the theory. With regard to the former, Parsons has written that Mrs. Ladd Franklin's theory "perhaps owes more than she would readily admit to Donders' theory." Now Donders accepted three fundamental colours—red, green and blue, but for colour sensations—red, yellow, green and blue, which, with a sensation of white, make the same five sensations as Mrs. Ladd Franklin postulates. There are many other points of similarity. Thus Donders stated in 1881 that from the combined chemical dissociations produced when both red and green light fall on the retina, a third colour—yellow—can arise. So, also, complete dissociation is stated to produce " white," while partial dissociations produce colours. Practically identical statements have been made by Mrs. Ladd Franklin, twelve years later, in 1893. We may say then that Donders' older theory bears a very

strong likeness to the one under consideration. Whether it anticipates all the fundamental points or not turns largely on the precise interpretation to be put on certain sentences, and need not be further discussed here.

In considering the advantages of this theory over others, we have, first, to determine whether it more readily fits the observed facts than do the others. Now Young's theory, while explaining the fact that all colours can be matched by a mixture of three primaries, also as readily explains the existence of complementary colours in spite of the statement to the contrary that Mrs. Ladd Franklin has made. The facts of simultaneous and successive contrast were once serious pitfalls to it, but they are so no longer because it is not necessary for a theory concerning processes taking place in the retina, to offer also explanations of processes occurring in the brain. An altogether separate theory must one day be elaborated to deal adequately with these processes. McDougall and Sherrington have pointed out the road; it will be the lot of some future physiologist to follow that road to its destination.

The various types of the colour-blind are also adequately dealt with by Young's theory. Where the theory fails is in its dealings with peripheral vision. How can it explain why green drops out, while yellow, red and blue sensations persist into the extreme periphery? Can it be that the maximum of the green sensation curve shifts towards the red to such an extent that a " neutral " band exists where green should be represented? We do not know. What we do know is that the last word on peripheral vision has yet to be written, in spite of the excellent work of Abney and of Ferree and Rand, and others. In this connection, then, Young's theory fails us and Mrs. Ladd Franklin's theory, in spite of its greater elaboration, is no more certain a guide.

Lastly, we may apply that most searching test which any theory can face, namely, its achievements in initiating research and in indicating new facts of colour vision. Has Mrs. Ladd Franklin's theory led to work comparable with that performed by Maxwell, Abney and Watson under the stimulus of Young's theory?

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4. *The Psychological Review*, Vol. XXIX, p. 180, 1922.

ANNOTATION

Official and Industrial Encouragement of Research

There are many problems of photography which can only be solved by a thorough knowledge of the physiology of vision. Apart from the question of the deleterious effect of radiations emanating from the sources of light which are used in the production of pictures, and especially of cinema films—a subject to which we have referred before (this Journal, Vol. V, 1921, p. 460)—the perfection of a photographic picture depends upon gradations of light and shade which conform as nearly as possible to the gradations as seen by the normal eye. The ordinary photographic film has a curve of sensitivity which corresponds with the actinicity of the spectral radiation and this, as is well known, increases rapidly towards the violet end of the spectrum, and still more rapidly in the contiguous ultra-violet region. The ultra-violet radiation produces no luminous impression upon the eye, and consequently the gradations of light and shade in a photograph taken on an ordinary plate give but an inadequate representation of the scene as viewed. By the use of suitable dyes the sensitivity of the film can be considerably increased in the most luminous portion of the spectrum (orthochromatic plates) and can be materially increased even in the almost inactinic red region (panchromatic plates). By the use of appropriate filters still further modifications can be introduced. The subject is further complicated by the divergence in the energy distribution of the radiation emitted by sunlight and the various forms of artificial illumination. Hitherto the public have been satisfied with very mediocre results, and the advances made by photographers have been in large part empirical. It is well known, for instance, that, although increase in actinicity is brought about by the use of light sources rich in ultra-violet radiation, these ultra-violet rays are almost completely absorbed by the glass lenses used in the photographic camera. It is only by accurate scientific investigation that the properties of light sources, lenses and films can be satisfactorily determined; and when all this has been accomplished there yet remains the accurate correlation of the results with the sensitivity of the retina. Very exhaustive investigations of this nature have been initiated by Loyd A. Jones* in the Research Laboratory of the Eastman Kodak Company. Apart from the special interest of this research to photographers, they are of great value to all who are interested in the physiology of vision; for such investigations nearly always reveal gaps in our knowledge of the reactions of the eye to various stimuli.

*Communication No. 135 from the Research Laboratory of the Eastman Kodak Co. (abstracted in *The Illuminating Engineer*, xv., pp. 247, 271, 1922.)

Loyd Jones is already known as the author of a valuable research on the discrimination of hue in the spectrum, a research which confirms the observations of Steindler and others, and is of the greatest theoretical importance to physiologists, psychologists and ophthalmologists. Our knowledge of heterochromatic photometry by the flicker method, which is also of profound importance in the theory of vision, has been developed and put upon a sound scientific basis by the exhaustive experiments of Ives, Nutting, Luckiesh, Troland and others. Nearly all this work has been done in the research laboratory of the National Lamp Association, Cleveland, Ohio, or the Nela (Lamp) research laboratories. Scientific results of the greatest value have followed researches initiated by the Bureau of Standards at Washington. It is a humiliating, but undoubted fact that Industrial Corporations in the United States are far more alive to the advantages of scientific research than are the corresponding bodies in Great Britain. The lethargy from which we were aroused during the war seems to have fallen upon us again. So far as encouragement by the Government is concerned the Medical Research Council and the Industrial Fatigue Board have succeeded in evading the axe, and are carrying on most admirable work. The National Institute of Industrial Psychology is also carrying on a financially precarious existence under the able supervision of Dr. C. S. Myers, but requires far more adequate support than it is receiving. We are grateful to our transatlantic rivals for the excellent research work which they are doing. In common with the rest of the world we are sharing the benefits. It is as much a matter of honour that we should make an effort to repay this debt as the more material debt which Englishmen are too proud to attempt to evade.

ABSTRACTS

I.—OCULAR PHLYCTENULAE AND TRACHEO-BRONCHIAL ADENOPATHY

Weekers and Colmant (Liège).—Ocular phlyctenulae and tracheo-bronchial adenopathy. (Phlyctènes oculaires et adénopathie trachéo-bronchique.) *Arch. d'Ophtal.*, February, 1922.

Weekers has on several occasions given expression to his belief that the subjects of phlyctenular kerato-conjunctivitis are tuberculous. He recognizes that this view is not universally accepted. It is true that the association is usually with tuberculosis of a quiet and torpid type compatible with apparent good health. In

one paper* he showed how frequently tuberculosis is clinically recognizable in cases of phlyctenular disease of the eyes. In the present paper the authors draw attention to one of the manifestations of tubercle, tracheo-bronchial adenopathy, frequent in children the subject of ocular phlyctenules. They have carried out a systematic investigation of 50 such cases by radiography. The majority were examined while suffering from phlyctenules, but a certain number were those exhibiting the sequelae of the disease. A few adults with active phlyctenulae or the corneal cicatrices left by them were included.

Among the fifty cases there were :—Thirty-four children under 15 years of age under care for phlyctenular lesions; two children formerly affected by phlyctenules; three adults with active phlyctenular disease; eleven adults who had suffered from phlyctenular attacks in early life.

In interpreting the radiographic plates the authors have been guided by the instructions given by Méry, Détré and Desmoulins in their recent work†. These investigators enumerate three degrees of changes visible in radiographs of the thorax; a brief description of them, aided by illustrations, is given by Weekers and Colmant in their paper, which should be consulted on these points.

In all the fifty cases, without exception, the radiographs revealed evidence of tracheo-bronchial adenopathy of the second or third degree, indicative of tuberculous glandular lesions. In all the subjects during a phlyctenular attack the radiographic signs were those of active glandular disease. In three adults, more than 30 years of age, who had had phlyctenular trouble in early life, the signs were those characteristic of the third degree, i.e., of healed and cicatrised gland lesions.

In view of the results of this series of examinations the authors conclude that the occurrence of ocular phlyctenules always denotes the co-existence of active lesions in the tracheo-bronchial glands.

Recognizing that the criticism may be made that thoracic adenopathy occurs frequently in children, and that its discovery may not be of great clinical importance, the authors examined ten control cases, non-phlyctenular children, chosen at random, suffering from squint, etc. In three of these there were no radiographic signs of diseased glands. In seven tracheo-bronchial adenopathy of the first degree was observed, appearances which they believe to be devoid of special significance. In none of the control cases could they detect the signs described by Méry, Détré and Desmoulins as characteristic of tuberculosis, signs which were recognizable in all their phlyctenular cases. J. B. LAWFORD.

* *Arch. d'Ophtal.*, 1909.

† Le diagnostic radiologique de la tuberculose ganglio-pulmonaire chez l'enfant. *Presse Médicale*, 19 March, 1921.

II.—THE DIAGNOSIS OF TUBERCULOSIS OF THE EYE

Gourfein, D. (Geneva).—The reaction of Besredka, radiography and radioscopy of the thorax in the diagnosis of the tuberculous nature of ocular affections. (La réaction de Besredka, la radiographie et la radioscopie du thorax dans la diagnostic de la nature tuberculeuse des affections oculaires.) *Revue Générale d'Ophtal.*, May, 1922.

Professor Gourfein has realized the extreme difficulty of ascertaining with certainty the cause of iritis, irido-cyclitis and irido-choroiditis cases by clinical methods. Close clinical study of such cases shows that no matter what may be their cause, they present no definite symptom which will reveal their specific nature. When the symptoms of irido-choroiditis or irido-cyclitis of tuberculous or syphilitic origin are analysed one realizes how difficult it is by clinical means to establish a precise differential diagnosis. Further, in the present state of our knowledge, it is impossible to make not merely an early but even a late clinical diagnosis of tuberculous ocular affections. Yet, the very thing that is required is an early diagnosis. While it is certainly true that ocular tuberculosis may actually be primary and constitute the sole lesion, in practice tuberculous ocular affections are often secondary. Numerous laboratory methods exist for the early diagnosis of ocular tubercle. Thus we have injection of tuberculin, the reactions of Arlouing-Courmont and of Mérieux, the cuti-reaction, the ophthalmo-reaction, etc. We all know that not one of these reactions has redeemed its promise, not one is infallible. None of these methods is specific, since each may fail in obvious tubercle or be positive in perfectly healthy subjects.

Gourfein in this article puts forward his results in this matter of diagnosis by combining thoracic radiography and radioscopy with the reaction of Besredka. The two former indicate the existence, the extent and the situation of lesions of the thoracic organs which auscultation and percussion are incapable of determining, but do not give any information as to the nature of these lesions; standing alone they are not conclusive. They are only of value when added to other probable signs. Therefore exploration by radiography has to be completed by other means of investigation which can inform us definitely as to the nature of the lesions found. One of these means is furnished by the reaction of Besredka, a method of diagnosis which is both early and scientific. The author has applied this combined method of diagnosis in 35 cases of various ocular affections, and relates five of these in full. In all the cases the Bordet-Wassermann reaction was also applied, a negative result being regarded as exclusive of

syphilis. In all the cases where the Besredka reaction was positive X-ray exploration showed old or recent lesions of the thoracic organs of greater or lesser extent. The author had taken care to exclude other infective maladies to which the origin of irido-cyclitis might be attributed. The final paragraph reads as follows:—" From the *ensemble* of cases to which we have applied the reaction of fixation with the Besredka antigen one may conclude that this reaction, even employed alone, but especially when associated with radiography and radioscopy, is very valuable exactly where clinical observation only furnishes a vague indication as to the tuberculous nature of ocular affections. It indicates with greater or lesser probability the presence in the organism of a tuberculous focus, but it does not give the direct proof of a colony of Koch's bacillus in the visual organ. This direct proof can only be given as we have shown (*Revue médicale de la Suisse Romande*, April, 1903), by puncture of the anterior chamber, by which method the bacillus of Koch may be found in the aqueous humour or by inoculation thereof into the anterior chamber of the rabbit."

ERNEST THOMSON.

III.—BARRAQUER'S OPERATION

(1) **Marbaix (Tournai).—Considerations on three cases of intracapsular cataract extraction by the Barraquer suction apparatus without the vibratory vacuum. (Réflexions sur trois cas d'extraction de la cataracte dans sa capsule par la ventouse de Barraquer sans vide vibratoire.)** *Ann. d'Ocul.*, Vol. CLVIII, November, 1921. (With one line drawing of bell-jar used.)

(1) In the present short article **Marbaix** refers to the academic discussions that have taken place on the anatomical attachments of the lens, one school holding that these are very intimate and the other that they can be ruptured with impunity, which the clinical results of Barraquer's operation would suggest. Probably advancing age and the development of the cataract may tend to reduce the risks that such rupture would entail in a clear lens in a young person, as Henry Smith has suggested. Barraquer's operation strongly supports the view that a cleavage is possible between the lens in its capsule and the patellary fossa.

Barraquer began by using buccal suction, but this is not usually more than 12 cm., while a pressure of 40-65 cm. is necessary, varying with the consistence of the lens. Marbaix uses a water pump attached to an inverted bell-jar in which lies the mercury manometer and from which comes the tube to the sucker. He

notes that in softish cataracts the anterior surface of the lens is apt to become prominent so that the antero-posterior diameter of the lens is increased. He paralyses the orbicularis by van Lint's method to start with and instils cocain for half an hour and euphthalmin for one and a half hours. He advises a conjunctival flap, and uses one drop of 1 per cent. bromhydrate of arécolin to help the pilocarpin effect. Marbaix had his third lens examined by van Duyse, Senr., who found no zonular fibres but two attached at equator. The posterior epithelium was pathological, tearing of it being evidenced by a rolling-up of the capsular membrane and the egress of some broken-up lens masses. The posterior rupture is described as " brutale." Some interruptions on the anterior surface were evidently due to the de Lapersonne knife used to divide anterior synechiae present. He urges that lenses should be examined, when removed by phakoerisis, to establish some of the anatomical facts at present in doubt. He is evidently much impressed by the possibilities of this operation.

W. C. SOUTER.

(2) **Munoz Urra, F. (Talavera).—A simple means for producing the vacuum necessary for the extraction of cataracts "in toto" according to the method of Barraquer—Phakoerisis. (Un moyen simple pour la production de vide nécessaire pour l'extraction de la cataracte "in toto" selon la méthode de Barraquer—Phacoérisis.)** *Ann. d'Ocul.*, Vol. CLVIII, November, 1921. (With two line drawings of the apparatus.)

(2) **Munoz Urra,** realizing the costliness of the electric motor and vibratory pump recommended by Barraquer, set himself to improvise something which would give the necessary vacuum pressure at the critical moment. He advises the use of a rolled copper cylinder, 17 cm. long, 7 cm. in diameter, completely closed save for a small pipe at one end to receive the rubber tube going to the sucker. Into the cylinder 20 grammes of water are placed and the cylinder is heated over a spirit lamp till steam comes vigorously out, the rubber tube is then slipped on, with a special tap on the tube before it reaches the sucker, closed, and then the cylinder is placed in cold water. Munoz Urra says he has done a large number of extractions with this apparatus and has obtained the same excellent results he got with the more expensive and elaborate outfit recommended by Barraquer. With careful control of the tap he speaks of being able to do eight to ten extractions on end, but in any case only a few minutes are needed to re-establish the desired vacuum. He intends later on to publish some observations on this operation and to suggest some lines of laboratory investigation in relation to intracapsular extraction of senile cataract.

W. C. SOUTER.

(3) **Gallemaerts (Brussels).—Twenty-four total cataract extractions by Barraquer's suction apparatus. (Vingt-quatre extractions totales de la cataracte par l'érisiphaque de Barraquer.)** *Ann. d'Ocul.*, Vol. CLVIII, March, 1921.

(3) **Gallemaerts** went to Barcelona and had the privilege there of assisting Barraquer at eighteen total extractions with his suction apparatus, and of performing six under Barraquer's supervision. He is, therefore, well qualified to give these useful hints as to the details and difficulties of this operation. The pupil should be well dilated with 1.5 per cent. to 5 per cent. euphthalmin, the eye anaesthetised with cocain-adrenalin, and the orbicularis can be put out of action by an injection of cocain, as recommended by van Lint and Villard. A rather larger incision than usual is needed in the limbus, whilst a peripheral buttonhole iridectomy is enough. There was no loss of vitreous in any of the 26 cases. Eserin was used after operation. Notes of these cases are given; in one the Morgagnian nucleus fell back into the vitreous, but was recovered later; in other two cases there was small inclusion of iris; all the others were most favourable, vision of 1 being obtained in seven cases, 0.9 in one, 0.8 in six, 0.7 in one, 0.6 in three and 0.5 in two. These results were obtained early, patients being able to read eight days after operation. The astigmatism was 3 D. Gallemaerts says one ought to see a few cases done, but that the operation is neither painful nor difficult, whilst the avoidance of all pressure on the eyeball, as is necessary in ordinary extractions, is an advantage. Cases should be chosen for the operation and the pressure of the vacuum can be altered to suit different kinds of opaque lens. Gallemaerts thinks highly of this operation of phakoerisis.

W. C. SOUTER.

IV.—SYMPATHETIC IRIDOCYCLITIS

Harbridge, Delamere F., M.D. (Phoenix, Arizona)—Sympathetic iridocyclitis. *Amer. Jl. of Ophthal.*, pp. 791-8, Series 3, Vol. V, No. 10, October, 1922.

Harbridge bases his remarks upon sympathetic inflammation chiefly on his experience of two cases in his own practice, and three others seen elsewhere. In his practice he has had many hundreds of cases of perforating injury of the eyeball, and the low incidence of sympathetic ophthalmia in his experience favours the view that the incidence of this condition is not more than 5 or 6 per cent.

One case which he reports in detail was that of a man, aet. 67, who had met with an injury of the right eye 6 weeks before observation. The injury was followed by complete loss of vision in that eye. The left eye for the last 2 years had suffered diminution

of vision, which had not apparently received any attention. On examination the R.E. was absolutely blind; it was painful, and commencing to shrink. Vision in L.E. was=6/60. There was slight ciliary injection, and several deposits of pigment on the lens capsule. The lens was somewhat cataractous.

Immediate enucleation of the blind eye was advised, but patient refused. He returned 5 weeks later with the history that the vision of the left eye had suddenly failed a few days previously. The eye then presented a typical picture of sympathetic irido-cyclitis. Vision = hand movements at 2 feet.

Enucleation was performed, but the patient was not very satisfactory during convalescence, and the left eye showed little or no improvement. Dental caries was revealed by radiograms some time afterwards, and the mouth was thoroughly cleared, with the result that within 20 days the eye had improved, vision being now =1/60. At the end of 5 months vision had risen to 5/60. When the patient was seen 15 months after the attack $V\bar{c}-4=6/15$, although the lens was cataractous and swollen.

The microscopic appearance of the enucleated eye is given in detail.

The other case cited by the author followed cataract operation, the exciting eye showing better vision in the end.

The author goes into the literature of the subject, and discusses the various theories put forward in explanation of the condition. He is of opinion that something may be borrowed from all the theories at issue, and that the true explanation lies in a resultant of all the different forces alleged to be concerned. He looks upon the circulation as the channel of infection, however the causative agent may have gained access to the blood stream.

He thinks several foci or different causes may be concerned. The same focus of infection may give rise to different manifestations according to the tissue involved. He asks if we are justified in looking upon sympathetic disease as a specific condition rather than as a secondary disturbance due to local changed metabolism—the source or agent being in the uveal tract of the sympathogenic eye. The injury followed by a low-grade inflammation lowers the resistance of the tissue, and the latter becomes susceptible to bacterial invasion or toxic agents. The products of this invasion reach the other eye and find affinity there. The focus which lights up the process may be a septic tooth (as in the author's case), the germs concerned having special affinity for uveal tissue. He considers it possible that the exciting cause may have no direct connection with the original cause (i.e., injury), and he argues from the fact that enucleation of the injured eye does not always save the sympathizing eye from destruction, that the exciting cause does not lie entirely in the injured eye.

He thinks it reasonable to infer that if the agent were sufficiently virulent to destroy the sympathizing eye it would produce the same result in the exciting eye, particularly as the resistance of the latter is at a low ebb owing to inflammation following injury. A possible explanation may lie in the assumption that the reaction is one of anaphylaxis contributed to by infection from various focal points.

At the time of injury the uvea develops immunity, and in the second eye this immunity has not had time to develop, so that the eye becomes an easy prey to the attack.

Whatever one may think of the theory set forth in this paper, one is entirely in agreement with the line of treatment advocated, viz., that possible sources of infection (e.g., dental caries) should be carefully attended to in all cases of sympathetic ophthalmia.

J. HAMILTON MCILROY.

V.—TRACHOMA AND END RESULTS

Burleson, John H. (San Antonio, Texas)—Trachoma and our end results. *Amer. Jl. of Ophthal.*, pp. 799-801, Series 3, Vol. V, No. 10, October, 1922.

Burleson announces at the beginning of his paper that he is going to express views which open up a new line of thought regarding trachoma. He looks upon trachoma as a "symptom complex," and not as a specific disease. Having enumerated the two chief views that obtain in regard to the aetiology of the condition, viz., (1) That the trachoma bodies are definite new growths of specific nature, and (2) that these bodies are natural lymphatic follicles which have undergone change on account of repeated attacks of inflammation, he gives it as his opinion that the changes in the lid are due to repeated attacks of chronic inflammation of any form, and not to the agency of any microbe which may be taken as specific for trachoma. Lymphoid infiltration leads to softening of the lid, and this is followed in its turn by the formation of scar tissue and contraction, with deformity of the whole lid. He considers that the chondritis (i.e., inflammamation of the tarsal cartilage) occurs merely as a complication of prolonged conjunctivitis, the nature of which may be various. Varieties of granulations (papillary, follicular, mixed, acute, and chronic) all depend upon the character of the particular inflammation which has been experienced. The author acknowledges that he has not met with an acute case which could be diagnosed as trachoma with certainty. He regards microscopic investigation as an essential factor in the differential diagnosis of a case, the clinical appearance not being sufficient.

His treatment falls into two categories according to whether he is dealing with an acute or a chronic case.

In the acute stage every effort should be directed towards the immediate cure; if one can control the early stages of inflammation, there will be no later stage, and therefore no trachoma "complex" will take place. He strongly disapproves of treatment (in the early stages) by caustics, or by grattage, as he attributes the formation of scar tissue to their agency to some extent. In the later stages, however, when chondritis has already become established, grattage may be of assistance in that it hastens cicatrisation and shortens the time that must elapse before surgical treatment for deformity of the lid can take place with good effect.

The operation that he favours for deformity is one advocated by Dr. Cary, of Dallas. It is performed upon the outside of the lid. An opening having been made in the skin, the skin and muscle are freed above and below, from the border of the lid to the upper border of the cartilage. The fibres of the muscle are removed by scissors, and the deformed tarsal plate is fully exposed. The tarsus is then removed in thin slices by means of a sharp scalpel, all the thickened projecting portions being shaved off. A thin flat plate is ultimately arrived at, manipulation being applied to straighten final irregularities. The author looks upon this operation as free from all the objections that may attend the usual plastic operations upon the lids, e.g., conjunctival adhesions granulating wound, corneal involvement, and relapse of the lid deformity.

J. HAMILTON MCILROY.

VI.—RELATIONSHIPS BETWEEN RADIANT ENERGY AND THE VISUAL PROCESSES

Sheard, Charles—Some important physical and physiological relationships between radiant energy, and the visual apparatus and processes, being the fourth Thomas Young oration. *Amer. Jl. of Physiological Optics*, October, 1922.

In this paper the author discusses some of those optical problems associated with the name of Thomas Young, herein aptly described as the "Father of physiological optics," and proceeds to elaborate some of the relationships between radiant energy and the visual processes.

He first considers the exact nature of the image received by the human retina, and points out that the vast preponderance of the visual world is represented in consciousness by ill-defined images. These obscure sensations, from the periphery of the retina, are the result of spherical and chromatic aberration and distortion. They

must be regarded as the necessary background through which the foveal image acquires a significance it would not otherwise possess.

Furthermore, in connection with the distortion which rays of light from a point source, not on the axis, undergo, he points out that their foci must vary according to the position in space, shape and colour, of the object viewed. This he thinks affords a basis for the notion of uniocular tridimensional space preception.

He next briefly discusses astigmatism and accommodation, and finally, passing from the consideration of these physical, to physiological and psychical relationships, proceeds to discuss colour vision at some length.

The three " classic " theories, e.g., Young-Helmholtz, Hering, and Ladd Franklin, postulate the existence in the retina of specific chemical substances, acted upon by light. The more modern theories, however, are largely built upon the basis of resonance phenomena. Resonance, in this connection, may be spoken of as a correlation between radiant energy, and what may be either chemically dissociated atoms or electrons. The author himself believes that the visual reception process is of a character included within the broad term " photo-electric."

In conclusion he realizes that the " explanation of the phenomena of vision in their entirety, must involve a knowledge of the laws of the brain and its operation, the functions and structure of nerve-tissues, and the physical chemistry of the retinal processes," and pleads that for the solution of such problems physicist, physiologist, and psychologist should all work together.

E. MAXWELL.

BOOK NOTICES

War Blindness at St. Dunstan's. By Sir ARNOLD LAWSON. Oxford Medical Publications. Henry Frowde and Hodder & Stoughton. 1922. Pp. 148. Price 7s. 6d.

This book is the outcome of a promise to the late Sir Arthur Pearson, by the author, " to present the work at St. Dunstan's from a purely medical standpoint " and contains the " history of over five years' medical work amongst the war-blind " by Sir A. Lawson and his colleague Major Ormond. During the war the cases under Sir A. Lawson's care numbered 825, while Major Ormond had charge of 1,008 blinded men, most of whom were transferred from his wards at the 2nd London General Hospital.

The book is in three parts. Part I deals with 407 men the subjects of traumatic blindness, arranged in groups, with brief

clinical notes of many cases. Though not adding greatly to our surgical knowledge of gunshot and other wounds of the eyes and adjoining structures, this part contains records of many cases of interest and of some with unusual features.

Part II is devoted to non-traumatic or disease blindness and comprises 417 cases. The causes of blindness in this category are very varied. While all the cases occurred in men on active service, many of them are not attributable directly to the conditions of war. The author holds advanced views concerning the effect of war service in precipitating blindness from causes already threatening it.

Part III contains two chapters, one on "Disability Pensions for the blinded Soldier"; the other on the "Re-education of the blinded Soldier." In the latter, Sir A. Lawson gives an interesting and sympathetic account of the efforts made and the success attained in teaching the blinded soldier, not merely, or chiefly, a trade or occupation, but the even more important lesson of adapting himself to an altered mode of life, in which he may still find contentment and modified happiness.

The printing, etc., is of the high standard we have learned to expect from the Oxford Medical Publications.

Colour Vision: A Discussion of the Leading Phenomena and their Physical Laws. By W. PEDDIE, D.Sc., V.P.R.S.E., Harris Professor of Physics, University College, Dundee, University of St. Andrews. London: Edward Arnold & Co. 1922. Price 12s. 6d.

There are two ways in which the phenomena and theories of colour vision can be taught. The phenomena, divorced as much as possible from theoretical considerations, can be described, and the theories then discussed in their relation to these phenomena. Or a theory can be stated and the phenomena discussed in the light of the theory. The latter method has generally been adopted, partly because it is the easier, but much more because most of the literature of colour vision has been written by the exponents of some given theory.

Professor Peddie is a whole-hearted adherent of the Young-Helmholtz theory. Like most physicists, he starts with the Newtonian law of colour mixture, which we agree with him in regarding as the basic fact of all colour sensation. The unassailable fact that practically every conceivable light or light mixture gives rise to a sensation, which can be accurately matched by the sensation produced by a suitable mixture of only three suitably chosen lights, led Thomas Young to the conclusion that the physiological receptive mechanism was a relatively simple mechanism involving only three variables. Helmholtz, who

adopted Young's hypothesis, submitted it to exhaustive mathematical treatment on the basis of Fechner's law of the quantitative relationship between stimulus and sensational response. "In view of the wider experimental basis now available, it is possible to bring in a mathematical representation through employment of the integrated form of Fechner's expressions of which Helmholtz used the unintegrated form in his work on differential sensitivity and the absolute fundamentals. In this way the whole subject of contrast, mutual interactions, decaying images, oscillating images, and inhibition, comes within the range of mathematical representation." This is the programme which Professor Peddie set out to fulfil.

The rescue from oblivion of Young's theory by Clerk Maxwell and Helmholtz, the experimental confirmation by the former and the mathematical elaboration by the latter, led to the almost universal adoption of this theory by physicists. Dealing, as it does, particularly with the phenomena of colour vision as viewed from the standpoint of physical stimuli it dealt with familiar subject matter in a familiar way, and the relatively simple mathematical exposition offered no obstacles. It was otherwise with physiologists. This was doubtless largely due to the fact that the full development of the theory was buried in Helmholtz's "Physiological Optics," and underwent modifications in the second edition. This epoch-making work has never been translated, and Professor Peddie's book is the first in English to deal really adequately with the Young-Helmholtz theory. It is true that the theory was too important to be ignored, so that it found its way into the physiological text-books. But many prejudices militated against it. Of these probably the most important was the mathematical form in which it was presented, for the biologist seems generally to be averse from all mathematical abstractions. Helmholtz himself contributed to the suspicion which fell upon the theory by resorting to psychological explanations of phenomena difficult to bring within its purview. Some of these explanations are demonstrably wrong, and one of the outstanding features of Professor Peddie's book is the valiant attempt to bring the facts of simultaneous and successive contrast, etc., into submission to the theory and to appropriate mathematical expression. While disclaiming any capacity to criticize the mathematics the physiologist cannot fail to view with some suspicion the important part played in the formulae by such elusive entities as the self-light of the retina and threshold sensations.

We have no hesitation in recommending this work as the best, most exhaustive, and most lucid exposition of the Young-Helmholtz theory in the English language. For a complete understanding of its contents, what to the physicist is an elementary, to

the physiologist a relatively considerable knowledge of mathematics is necessary. But physiologists who are lacking in mathematics may rest assured that the deductions are justified on the bases of the given premises, and consequently they will find a wealth of information which will repay perusal. Although suspicion may still persist that some of the assumptions necessary to bring certain phenomena of vision within the purview of the trichromatic theory are unwarranted, the immediate deduction from it of such facts as the observed differential sensitivity of the normal eye to different wave-lengths, the approximation of all colour sensations to white at high intensities, etc., places it in the same category of utility as the Undulatory Theory of Light. As Thomas Young wrote :—" Although the invention of plausible hypotheses, independent of any connection with experimental observations, can be of very little use in the promotion of natural knowledge; yet the discovery of simple and uniform principles by which a great number of apparently heterogeneous phenomena are reduced to coherent and universal laws, must ever be allowed to be of considerable importance towards the improvement of the human intellect and in proportion as more and more phenomena are found to agree with any principles that are laid down, those principles must be allowed to acquire a stronger right to exchange the appellation of hypothesis for that of fundamental laws of nature."

As Professor Peddie says :—" The grounds upon which fitness is admitted in matters of scientific theory are : Simplicity, accuracy and sufficiency. . . . But sufficiency implies productivity also; theory must serve as an instrument of research, predicting unknown but actually existent phenomena."

The Nature of Glaucoma. (Das Wesen des Glaucoms.) By Dr. O. WERNICKE, Buenos Ayres. Buenos Ayres: Oscar B. Mengen. 1922.

This is a surprising work. The author took conical cornea as a subject for special study in leisure hours. To discover its origin he sought for similar change in other structures and convinced himself " that disseminate sclerosis, myopia, glaucoma, diabetes, and chronic rheumatism rest on the same fundamental cause." His argument, put forward piecemeal in previous papers, is here developed in elaborate detail. We can only outline it.

Conical cornea, being usually bilateral, is due to a general rather than a local cause; therefore analogous changes probably occur from the same cause in other parts. It is seated in fibrous tissue and is therefore probably of rheumatic, i.e., arthritic nature. It has no distinctive histological mark, but is a persistent, painless, non-inflammatory lesion, non-irritative to adjacent tissue; therefore analogous lesions will not be easily discovered unless they

obviously disturb function, as in the cornea; they should be most obvious when occurring in the nervous system. Disseminate sclerosis has certain of the characters named and is probably "nothing else than the cerebral localization of chronic rheumatism." Let us look, therefore, for ectasia, resulting from multiple arthritic lesions or foci in other parts, especially in parts of the eye other than the cornea.

Myopia and glaucoma simplex depend essentially on foci of this nature in the sclera and papilla. The foci are not directly discoverable but are manifest in the ectasia they induce; according to their situation they cause the one or the other of these closely allied disorders, or both together. Myopia is commonly ascribed to congenital weakness of the sclera, but this idea fits badly with the fact that its appearance is often delayed until after puberty, and sometimes till old age; that it may appear in one eye only; that the ectasia is confined to the posterior hemisphere; and that it leads to choroiditis and detachment of the retina. It is better explained by ascribing it to an intermittent arthritic process.

Glaucoma has been studied for 60 years as though it were essentially due to excess of pressure, with the result that our knowledge of its real nature has not advanced; the tonometer can no more reveal its origin than the thermometer can reveal that of fever. Certain of the earlier writers understood it better: excess of pressure is a frequent symptom, but not an essential or constant part of the disorder. In the present work *glaucoma simplex* stands for atrophy of the papilla with excavation, *glaucoma hypertensum* for so-called primary rise of pressure. The two forms are often combined but may occur separately. Excess of intraocular pressure is always secondary; when it is secondary to obvious disease the terms glaucoma and glaucomatous do not apply to it.

Glaucoma simplex is essentially due to arthritic foci, and is of three kinds according to the position of the lesion: *neural,* when the focus is in the papilla or close behind it; *scleral,* when it is in the sclera and invades the papilla therefrom—the commonest form; *uveal,* when it is in the choroid and thence reaches the papilla. The arthritic focus leads to softening of the lamina cribrosa and excavation of the papilla; also to Schnabel's caverns. The neural form may begin with symptoms of retro-ocular neuritis. Excess of pressure may be present or absent in each of these forms; it may increase the excavation but does not cause it.

Glaucoma hypertensum, all are agreed, depends on changes in the ciliary body and anterior part of the choroid, but whether through blocking of filtration channels by pigment masses, altered secretion, or hyper-secretion, opinions differ. The changes are insidious, hidden from inspection, and may long

precede the rise of pressure; the old idea was a latent choroiditis; the actual origin is the same as that which leads to ectasia in the cornea and in the papilla—a chronic painless arthritic process. This leads not only to excess of pressure but also to detachment of the retina; hence the association of these complications. The question how it does so "lies outside the scope of this work."

We will not follow the author's speculations as to the effects of the hypothetic arthritic foci on other parts—joints, skin, muscles, liver, kidney, endocrine glands, etc. His work covers 160 pages, and teams with ideas and with citations that give them more or less support; it represents much ingenuity and book-work. With regard to his glaucoma theory we feel confident that if, after building it so assiduously, the author had spent equal pains in testing its strength, he would himself have demolished it. Its weakness, or what appears to us to be its weakness, he has himself explained. He tells us candidly on his first page that during his 25 years of work now completed, as head of a large eye clinic, he had little time for scientific study and was obliged to "grossly neglect the laboratory."

In the laboratory one finds excavation of the optic disc in nearly all the eyes, no matter what their original disease or injury, that had been too tense, and in no others; the few exceptions are easily accounted for. The inference is that the excavation has been caused by excess of pressure. To ascribe it to another and purely hypothetic cause in some of these eyes, while offering no explanation of it in the others, seems unreasonable. Again, those who have followed their morbid material to the laboratory, and have studied the escape of fluid from the eye under varying conditions, will hardly accept a glaucoma theory which makes no mention of a displaced iris-base. To discuss Dr. Wernicke's argument step by step would be, we fear, to attack it all along the line.

Jahresbericht ueber die gesamte Ophthalmologie, zugleich bibliographisches Jahresregister des Zentralblattes für die gesamte Ophthalmologie und ihre Grenzgebiete, und Fortsetzung des Nagel-Michelschen Jahresberichts. Edited by Prof. Dr. O. Kuffler. Forty-seventh year: Report for 1920. Berlin. 1922.

In pre-war days one of the most valuable publications in ophthalmic literature was Nagel's *Jahresbericht.* It contained accurate reports of all the most important papers of the year, not only on ophthalmology proper, but also on the physiology of vision, comparative ophthalmology, and physiological optics. It was admirably arranged and indexed, and, considering the enormous amount of work involved, appeared with commendable regularity a year or eighteen months after the year in which the papers were published.

In 1913 a new German publication, the *Zentralblatt* for general ophthalmology and its borderline subjects, was started. It was issued monthly, and thus avoided the delay in making the abstracts of papers available for readers. Six volumes of this work have appeared, and show little signs of the influence of the War. Nagel's *Jahresbericht*, however, apparently succumbed, and it is only now resuscitated in a somewhat different form. The subjects are classified much in the same manner as in former volumes. Instead, however, of specific abstracts of all the papers, each section is preceded by a general introduction (*Uebersichtsreferat*). A complete bibliography is appended to each section and each item in the bibliography has the reference to the abstract in the *Zentralblatt* appended. In order, therefore, to obtain both bibliography and abstracts it is necessary to have both *Jahresbericht* and *Zentralblatt*. So far as the abstracts in the *Zentralblatt* are concerned, we have found them excellent and quite on the same lines as in the former volumes of the *Jahresbericht*. The introductory survey of each section in the *Jahresbericht* is in every case well done, and has the advantage of throwing the different contributions into a proper perspective. There are good indexes of authors and subjects.

NOTES

Deaths

ALL medical practitioners will regret to learn of the death of WILHELM VON ROENTGEN at Munich, at the age of 78. His discovery of X-rays in 1895 revolutionized the whole aspect of medical and surgical diagnosis and treatment.

We regret to record the death of Dr. ALFRED HENRY FISON, Lecturer in Physics at Guy's Hospital and the London Hospital. Death followed injuries caused by a fall while fixing an aerial for a wireless entertainment at the former institution. An optical article from his pen was published in this Journal of June, 1919.

Another loss to be deplored is that of WALTER WILLIAM SINCLAIR, M.B., aged 54, ophthalmic surgeon to the East Suffolk and Ipswich Hospital, which took place at Ipswich on January 29. Some details of his life will be published in the next number of this Journal.

Dr. A. H. GAITSKELL died at Westcliff-on-Sea on January 1, 1923. He was Ophthalmic Surgeon to the Victoria Hospital, Southend, and to the Corporation Children's Eye Clinic.

Appointments

Dr. B. G. S. ACHARYA has been appointed Professor of Ophthalmology in Lucknow University.

Mr. CECIL B. E. TIVY has been appointed assistant Ophthalmic Surgeon to the Royal Albert Hospital, Devonport.

Dr. ALFRED VOGT has been appointed Director of the University Eye Clinic at Zurich and purposes to give a course of lectures on "Slit-lamp microscopy" there in September next.

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Medical Research Council

THE Medical Research Council, in accordance with a recommendation of the Departmental Committee on Type Faces (1922), has appointed a Committee to investigate the physiological and psychological aspects of printing. The Members of the Committee are:—Sir John Herbert Parsons (chairman); Mr. L. A. Legros, member of the Type Faces Committee; Mr. F. C. Bartlett, Director of the Cambridge Laboratory of Experimental Psychology; Dr. H. Hartridge, of the Cambridge Physiological Laboratory; and Dr. Edgar Schuster, Hon. Fellow of New College, Oxford.

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Ophthalmological Society of the United Kingdom

THE next Annual Congress of the Society will be held on April 26, 27 and 28, 1923, at the Royal Society of Medicine, 1, Wimpole Street, W.1. On the morning of April 26, the President, Dr. A. Maitland Ramsay, will deliver his opening Address. In the afternoon of that date, a discussion will take place on "The Disorders of the Blood and their Ophthalmological Manifestations." It will be opened by Sir Humphry Rolleston, K.C.B., Sir Frederick Andrewes, F.R.S., and Dr. W. C. Souter. The Bowman Lecture will be delivered at 5 p.m., on the same day, by Professor George E. de Schweinitz, on "Certain Ocular Aspects of Pituitary Body Disorders, mainly exclusive of the usual Central and Peripheral Hemiopic Field Defects." Members will dine together in the evening.

The morning of April 27 will be devoted to a discussion on "The Diagnostic Significance of Proptosis," to be opened by Mr. Wilfred Trotter, Mr. Herbert Fisher, and Dr. Angus MacGillivray. The afternoon will be devoted to a visit to the London Hospital, Whitechapel. Members are invited to show cases of interest at this meeting.

The Business Meeting of the Society will be held at 10 a.m. on April 28.